natural resources

Tornado mechanics

The Nimbus and other weather satellites are helping determine why and how tornadoes form, their structure and dynamics, and—ultimately—how they can be prevented or artifically dissipated.

NASA-Marshall also is planning a cooperative research program later this year with the University of Arkansas to investigate how tornado damage occurs and to develop tornado-resistant building designs. The hardware and field-data collection are funded by the Technology Utilization Office, while data reduction is being performed by the National Oceanic & Atmospheric Administration.

Tornadoes cause extensive damage in the U.S., primarily by wind from 200 to 700 mph acting directly on structures or in combination with flying debris—as opposed to damage caused by pressure drops.

Purpose of the new research will be to gain better knowledge of wind forces, conditions sufficient to trigger the storms, the interaction of the wind with all parts of a building, and the way a structure collapses in high winds. Aerial photographic reconnaissance of the storm track in progress is needed, along with additional wind-tunnel and analytical modeling work.

The use of urban land

Suggesting how our finite American land can be used most effectively, especially in metropolitan areas, is one of the more important contributions space technology has to offer the nation.

Techniques developed for analyzing scientific information from the lunar and planetary missions now are being applied to land-resource management in and around cities. Two systems have been formalized by NASA's Jet Propulsion Laboratory and are being applied in the Los Angeles region.

The first, called the "land-use management information system," incorporates maps, aerial photos and other land data into routine city and county census records.

To achieve this merger of information, the JPL system uses a graphics terminal to display city-street networks. Urban planners can query their data bases and display numerical values for each of the city blocks shown on a TV screen.

They can command information for study-area selection, geographical specifications, street-network mapping, and other data. Instructions are provided in ordinary English, instead of computer language, thus making the graphics portion of the system self-teaching.

The system is being developed in such a way that it can be transferred to the more than 200 major U.S. cities utilizing computerized U.S. Census Bureau files of street networks and block-by-block demographic statistics of street networks and block-level census statistics.

The second system, "multiple-input land use," combines satellite imagery with other data sources. Its developers now are concentrating on the precise registration of two-dimensional pictures and the interfacing of this information with existing data files.

The first demonstration of the system will be applied in Los Angeles early this year. Multispectral analysis of data from Landsat images will assist the city in making basic rezoning decisions.

JPL also is working to bring the land-use management information systems to Tacoma, Wash. Essentially a city street map in computer-readable form, the system will help planners in traffic-accident analysis, mapping, and land-record integration.

Landsat photograph of Los Angeles enhanced by computer techniques results in urbanized and agricultural land being sharply differentiated from natural areas. Ocean portion of photo shows coastal sediment transport patterns, sewage outfall, and plumes associated with oil seepages. Extreme contrast reveals haze pattern along the Malibu and Santa Monica coast and south of the Channel Islands. The image to the right has been of use to California Coastal Zone Conservation Commission in its drafting of an overall coastal plan.